GRADE 11

HIGH SCHOOL
STUDENT PRACTICE TEST BOOKLET

Student Name: _____

MEA
Maine Educational Assessment

RELEASED 2016 SCIENCE ITEMS

Maine Department of Education

SCIENCE PRACTICE TEST

This practice session has twenty multiple-choice and two constructed-response questions.

Choose the best answer for each multiple-choice question and mark your answer choices for questions 1 through 20 in the spaces provided on page 2 of your practice test answer booklet.

1. Which statement explains what will most likely happen if all the available resources in an ecosystem can no longer support the size of its coyote population?

(A) Pressure from the coyote population will result in an increase in ecosystem resources.

(B) Individuals in the coyote population will adapt to the limited resources.

(C) The number of coyote deaths in the population will be greater than the number of coyote births.

(D) The coyote population will remain stable.

2. A chemical reaction is shown in the equation below.

$$4Al(s) + 3O_2(g) \rightarrow 2Al_2O_3(s) + energy$$
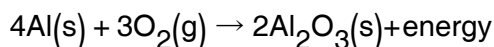
Which action would increase the reaction rate?

(A) decrease the temperature in the reaction container

(B) decrease O_2 concentration in the reaction container

(C) increase the size of the reaction container

(D) increase O_2 concentration in the reaction container

3. An enzyme called pepsin breaks down proteins during digestion in the stomach. Why does the body need pepsin?

(A) Food proteins are too large to pass through cell membranes.

(B) Large proteins do not fit into the small intestine.

(C) Small proteins have more energy than large proteins.

(D) Food proteins are different from proteins made by the body.

4. The diagram below shows the convection currents involved when the tectonic plates in Earth's crust move.
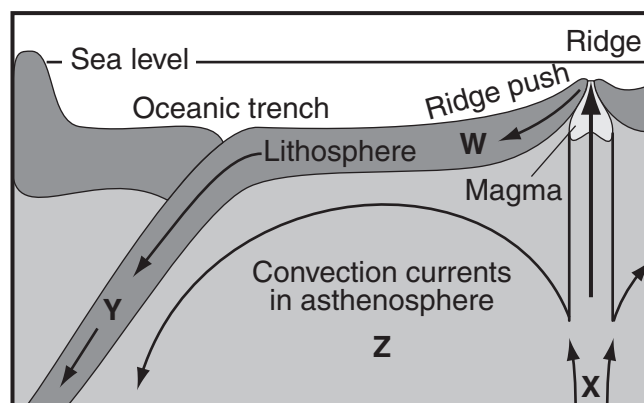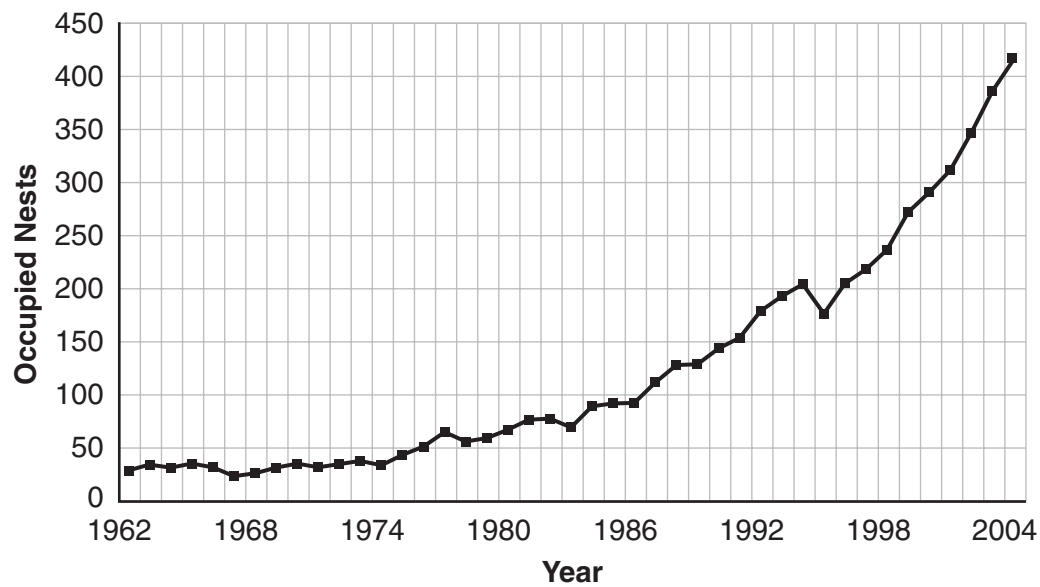

Based on the diagram, where would the highest temperatures be found in this process?

(A) region W

(B) region X

(C) region Y

(D) region Z

PLEASE GO ON ➡

5. The graph below shows the number of occupied bald eagle nests in Maine between 1962 and 2005.

Which human activity most likely had the greatest influence on the trends shown in the graph?

(A) hunting animals that prey on eagles

(B) breeding eagles in captivity

(C) importing eagles from other regions

(D) protecting the habitat of eagles

6. Which change occurs when a ball is pushed from the bottom to the top of a ramp?

(A) The mass of the ball decreases.

(B) The air pressure on the ball increases.

(C) The friction of the ball decreases.

(D) The potential energy of the ball increases.

7. Which instrument is used to collect radio waves emitted by galaxies?
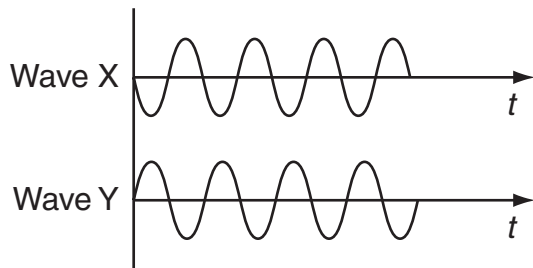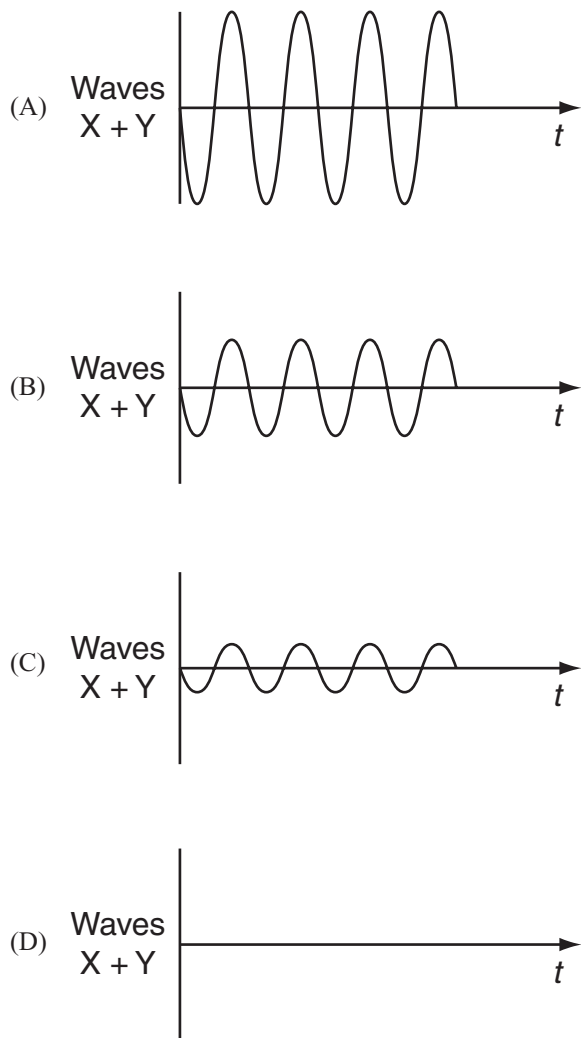
(A)

(C)

(B)

(D)

PLEASE GO ON ➡

8. The diagram below represents two sound waves: Wave X and Wave Y.

Which diagram represents what happens when Wave X interacts with Wave Y?

(A) Waves X + Y

(B) Waves X + Y

(C) Waves X + Y

(D) Waves X + Y

9. Which of the following describes the bonds in a water molecule?

(A) polymeric

(B) ionic

(C) nonpolar, covalent

(D) polar, covalent

10. Acid rain decreases the pH of rivers and lakes. The chart below shows the acid tolerances of some organisms and their food sources in rivers and lakes.

Acid Tolerances of Organisms

	pH					
	6.5	6.0	5.5	5.0	4.5	4.0
Trout	Tolerant	Tolerant	Tolerant	Tolerant	Not tolerant	Not tolerant
Bass	Tolerant	Tolerant	Tolerant	Not tolerant	Not tolerant	Not tolerant
Perch	Tolerant	Tolerant	Tolerant	Not tolerant	Tolerant	Not tolerant
Frogs	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant
Salamanders	Tolerant	Tolerant	Tolerant	Tolerant	Tolerant	Not tolerant
Clams	Tolerant	Tolerant	Not tolerant	Not tolerant	Not tolerant	Not tolerant
Crayfish	Tolerant	Tolerant	Tolerant	Not tolerant	Not tolerant	Not tolerant
Snails	Tolerant	Tolerant	Not tolerant	Not tolerant	Not tolerant	Not tolerant
Mayflies	Tolerant	Tolerant	Tolerant	Not tolerant	Not tolerant	Not tolerant

Key
- Tolerant
- Not tolerant

Which statement describes how continued acid rain will affect the population dynamics of rivers and lakes?

(A) As the pH decreases, the trout population will be affected before the bass population.

(B) Most of the species will be affected at a pH of 6.0.

(C) If the pH goes below 5.5, many species will be affected by a reduced food supply.

(D) The only fish that is affected at a pH of 4.5 is the bass.

PLEASE GO ON

11. Some conifer trees have a shallow root system and dark green, needlelike leaves covered with a thick layer of wax. Which statement best explains how one of these adaptations helps conifers survive cold, dry winters?

(A) The needlelike shape of the leaves traps warm air around the tree.

(B) The waxy covering on the leaves slows the loss of water from the tree.

(C) The shallow root system melts snow around the tree and takes in the melted water.

(D) The dark green color of the leaves absorbs heat from the Sun and keeps the tree warm.

12. Which of the following correctly describes the nucleus of an atom?

(A) positively charged; contains protons and neutrons

(B) no charge; contains electrons and protons

(C) positively charged; contains electrons and neutrons

(D) no charge; contains protons, neutrons, and electrons

13. Which observation best supports the theory of evolution?

(A) Sand dollar fossils from three million years ago are almost identical to living sand dollars.

(B) A fossil found in China has features in common with dinosaurs and modern birds.

(C) Only fossils of ginkgo tree leaves had been found until living ginkgo trees were discovered in Asia.

(D) The Burgess Shale contains fossils rarely found anywhere else on Earth.

14. A school bus is moving at 30 mph relative to an observer standing on the sidewalk. A student drops a cookie out an open window of the bus. At the instant the cookie is dropped, how fast is the cookie moving relative to the observer and relative to the student?

(A) 0 mph relative to the observer and 0 mph relative to the student

(B) 0 mph relative to the observer and 30 mph relative to the student

(C) 30 mph relative to the observer and 0 mph relative to the student

(D) 30 mph relative to the observer and 30 mph relative to the student

15. What is the best estimate of the age of the universe and Earth based on scientific evidence?

(A) 220.0 million years for the universe and 4.5 million years for Earth

(B) 550.0 million years for the universe and 220.0 million years for Earth

(C) 4.5 billion years for the universe and 550.0 million years for Earth

(D) 14.0 billion years for the universe and 4.5 billion years for Earth

16. A student is using a paddle wheel and a bucket of water to construct a model of a waterwheel, as shown below.
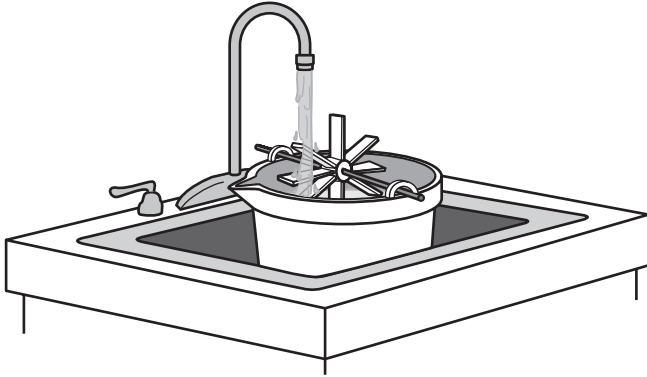
The student's model design causes the waterwheel to turn very slowly. The student wants to design a second model to make the waterwheel turn more quickly.

How does the student modify the model to cause the waterwheel to turn more quickly?

(A) by increasing the bucket's height to increase the potential energy of the water in the bucket

(B) by increasing the paddle wheel's size to increase the kinetic energy of the wheel as water strikes the paddles

(C) by decreasing the volume of water poured into the bucket to increase the potential energy of the water in the bucket

(D) by decreasing the bucket's height to increase the kinetic energy of the water hitting the wheel

17. A cell builds a chain of amino acids that is ordered according to instructions in a gene. What is the direct result of this process?

(A) A gamete is formed.

(B) A ribosome is formed.

(C) A DNA molecule is formed.

(D) A protein molecule is formed.

18. How does photosynthesis play a critical role in maintaining ecosystems?

(A) Photosynthesis recycles solar energy.

(B) Photosynthesis uses solar energy to cycle carbon.

(C) Photosynthesis uses solar energy to store nitrogen.

(D) Photosynthesis uses solar energy to break down nitrogenous waste products.

19. The distance to the closest star other than the Sun is 40,000,000,000,000 km. A light-year is 9.5×10^{12} km.

How far away is the closest star in light-years, and why are light-years generally used to measure astronomical distances?

(A) It is about four light-years; light-years are a more accurate measurement than kilometers.

(B) It is about four light-years; numbers in light-years are easier to work with than numbers with exponents such as 10^{13}.

(C) It is about 40 light-years; light-years are a more accurate measurement than kilometers.

(D) It is about 40 light-years; numbers in light-years are easier to work with than numbers with exponents such as 10^{13}.
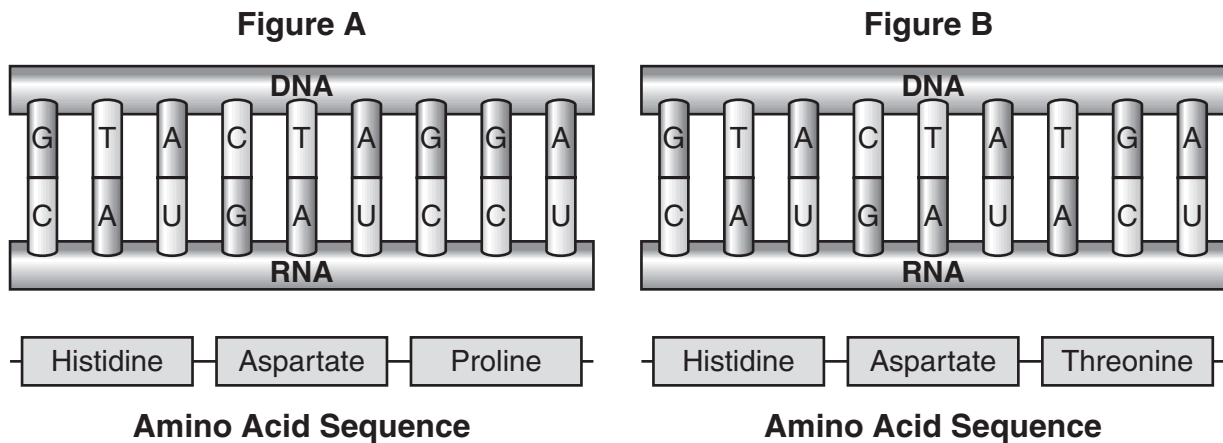
20. What is one way in which water supports life?

(A) It acts as a building block for DNA.

(B) It forms a long chain of organic molecules.

(C) It maintains a constant pH in blood.

(D) It transports cellular waste.

21. Figure A shows the DNA, RNA, and amino acids associated with the expression of part of a gene sequence. Figure B shows the same information for a mutation.

Figure A

DNA
G T A C T A G G A
C A U G A U C C U
RNA

| Histidine | Aspartate | Proline |

Amino Acid Sequence

Figure B

DNA
G T A C T A T G A
C A U G A U A C U
RNA

| Histidine | Aspartate | Threonine |

Amino Acid Sequence

a. Provide evidence that a mutation occurred from Figure A to Figure B. Explain the effect of the mutation on the resulting amino acid.

b. Describe whether all mutations affect organisms and future generations in the same way. Explain your reasoning.

22. Earth is a suitable place for life because the atmosphere, geosphere, and hydrosphere provide conditions that make Earth habitable.

Describe <u>four</u> conditions that make Earth habitable. Explain how each of these four conditions is provided by the atmosphere, geosphere, or hydrosphere.